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Age and Size Statistics for Rainbow Trout Collected in the Susitna River Drainage during 1991

by

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ABSTRACT

Upper Cook Inlet rainbow trout *Oncorhynchus mykiss* stocks are managed under the Cook Inlet Rainbow Trout Management Plan. This plan, adopted by the Alaska Board of Fisheries during 1986, calls for the protection of the area's wild rainbow trout stocks in terms of maintenance of historic age and size compositions and stock densities while maximizing the recreational benefits of this resource. Little historic stock composition data exist, however, for many of the area's wild rainbow trout stocks to guide the management of these stocks under the guidelines established by the policy. For this reason, a study was initiated during 1990 to provide baseline age and size composition statistics and stock structure information for the major rainbow trout stocks of the Susitna River basin. These data should guide the development of future options for the management of the Susitna River basin's wild rainbow trout stocks. This study presents the results of the 1991 studies and recommendations for future work including assessment of stock structure.

During 1991, 1,104 rainbow trout were sampled using hook and line gear from two study reaches in Lake Creek, the Talachulitna and Deshka rivers, and from one study reach in the Kashwitna River. Overall, sampled rainbow trout ranged in fork length from 195 millimeters to 584 millimeters and in age from 2 to 7 years. At all sites, the mean length-at-age of sampled rainbow trout increased with age. Significant differences occurred in mean lengths, length distributions, age compositions, and mean length-at-ages of rainbow trout captured between some reaches in study streams and between some study streams. In combination, these data suggest that multiple stocks of rainbow trout inhabit the Susitna River basin. Limited recovery of tagged fish, however, suggest that some migrational movements occurred between study reaches, particularly reaches within the same tributary.

Significant differences in age composition and mean length-at-age statistics occurred for select Susitna River tributaries sampled during 1989, 1990, and 1991, suggesting that age and size compositions vary annually. Such findings make management for historic size and age compositions difficult, and show the importance of collecting data over a period of years. Lastly, the occurrence of few trout over 510 millimeters fork length (the size limit defined in the Cook Inlet Rainbow Trout Management Plan for trophy trout) and the relatively slow growth rate of Susitna River basin trout in comparison to other Alaskan waters containing trophy trout suggest that Susitna River rainbow trout stocks are not viable candidates for management as trophy fisheries under the Cook Inlet Rainbow Trout Management Plan.

KEY WORDS: rainbow trout, *Oncorhynchus mykiss*, age composition, mean length-at-age, length distribution, mean length, size, management, Susitna River drainage, Lake Creek, Deshka River, Talachulitna River, Kashwitna River, migration, hook and line.

INTRODUCTION

During 1990, just over 200,000 angler-days were expended by recreational anglers fishing in the Susitna River drainage (Figure 1). This effort represented approximately 10% of the total fishing effort expended by recreational anglers in Alaska during 1990 (Mills 1991) and represented an increase in recreational angler effort in the Susitna River drainage of over 50% over the past decade (Mills 1980-1991). This growing popularity is expected to continue as the number of recreational services (e.g. sport fish lodges, charter and guiding operations) grows and the quality of fishing access continues to improve throughout the Susitna River drainage. Though the majority of sport fishing effort expended in the Susitna River drainage appears to be directed towards harvesting anadromous stocks of Pacific salmon *Oncorhynchus* (Hepler and Vincent-Lang 1988), a significant portion is also believed to target the area's wild rainbow trout *Oncorhynchus mykiss* stocks.

The Susitna River drainage has historically supported one of the largest sport fisheries (in terms of harvest) for wild rainbow trout in Cook Inlet (Mills 1991). Harvests of rainbow trout from Susitna River drainage waters remained fairly stable throughout most of the 1980s (Figure 2; 14,952 to 23,081; 1980-1988 mean of 17,887). More recent trends since 1988, however, indicate a substantial decline in harvests; harvests during 1989 and 1990 totalled only 10,044 and 9,440 rainbow trout, respectively. It is unknown whether this decline is attributed to overexploitation in the sport fishery, changes in stock densities, shifts in angler ethics (i.e., an increase in catch and release), or simply a result of more restrictive regulations recently imposed on the sport fishery. The declines in harvest, coupled with increasing effort, however, have sparked an upsurge in public awareness regarding the conservation and welfare of this valuable resource. In particular, recreational anglers worry that the larger and older rainbow trout are becoming increasingly vulnerable to overexploitation by the sport fishery.

In response to this concern, the Alaska Board of Fisheries (ABOF) adopted the Cook Inlet Rainbow/Steelhead Trout Management Policy (CIRTMP) during 1986. This policy (ADF&G 1986) calls for the protection of the area's wild rainbow trout stocks in terms of maintenance of historic age and size compositions and stock densities while maximizing the recreational benefits of this resource. The policy provides fishery managers with a wide spectrum of sport fishing regulatory options, including gear restrictions, time and area closures, bag limit changes, and catch and release regulations, to govern the management of the area's wild rainbow trout fisheries for stated objectives. These regulations were adopted, however, with little understanding or knowledge of the biology and structures of the area's wild rainbow trout stocks nor of their historic age and size compositions. As a result, fishery managers have little information other than harvest trends estimated through postal surveys (Mills 1991) to evaluate the impact of their management strategies on the long-term health of the area's wild trout stocks. With increasing angler pressure and changes in sport fishing ethics and fishing regulations, annual harvests however are believed to be no longer directly comparable.

The lack of historic stock structure and age and size composition information for Susitna River drainage rainbow trout stocks has forced fishery managers to take a more conservative approach for managing the drainage's wild rainbow trout stocks to assure that the policy goals of the CIRTMP are achieved.

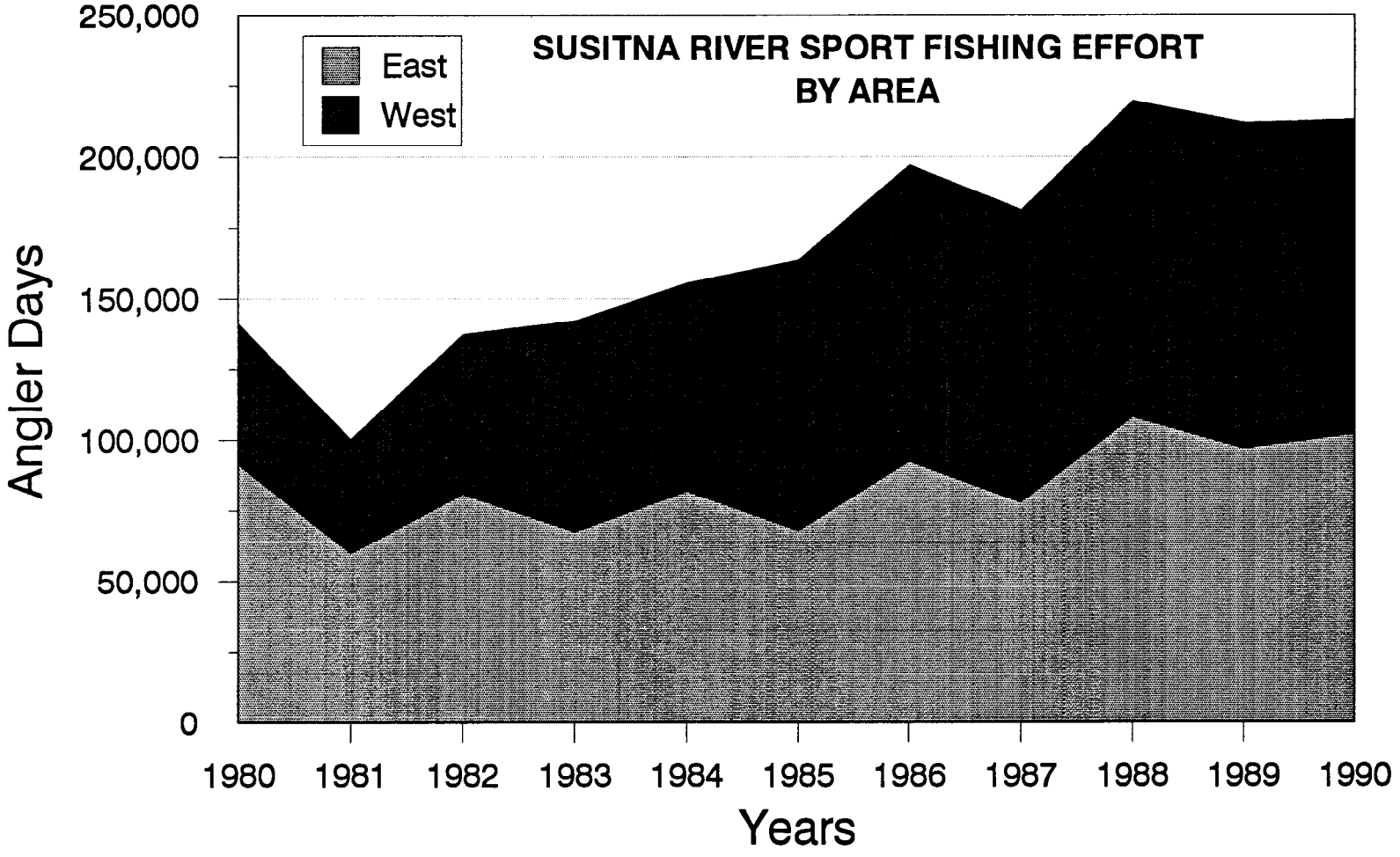

Figure 1. Number of angler-days of fishing effort expended by recreational anglers fishing Susitna River basin streams, 1980-1990 (Mills 1981-1991).

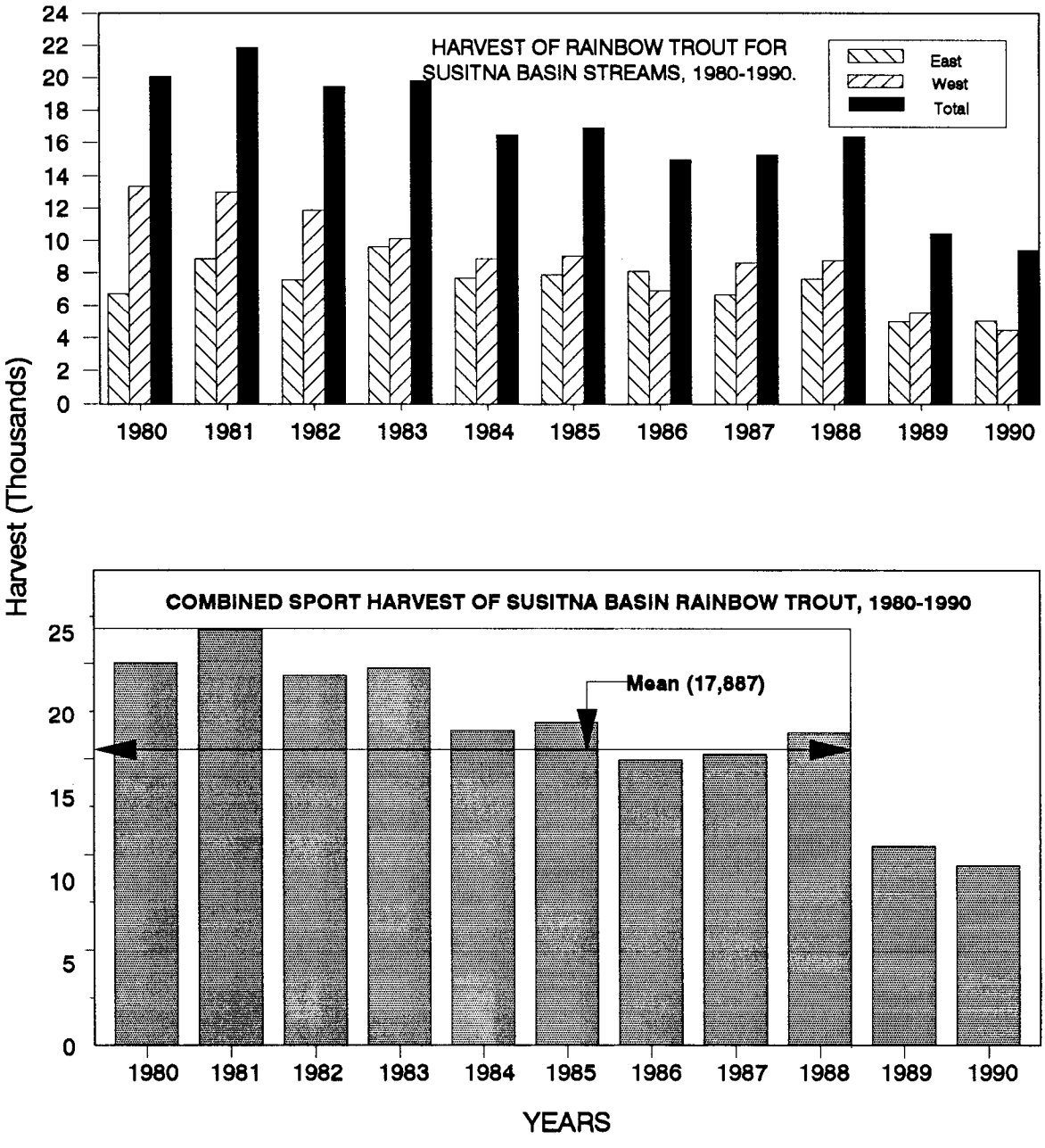

Figure 2. Harvest of rainbow trout by recreational anglers fishing Susitna River basin streams, 1980-1990 (Mills 1981-1991).

Also, it is likely that even more restrictive fishing regulations may become necessary if effort directed towards the stocks continues to increase. Although fishing opportunities may be needlessly reduced in some cases as a result of these actions, this conservative approach is warranted given the paucity of historic stock-specific data for these stocks and the growing popularity directed at the stocks.

To guide the development of management criteria for the Susitna River basin's wild rainbow trout stocks under the directives set forth in the CIRTMP, a study was initiated by the Alaska Department of Fish and Game (ADF&G) during 1989 to establish a baseline database of age and length composition statistics for selected Susitna River wild rainbow trout stocks. A secondary objective of this study was to evaluate the structures of these stocks. These data will be used to examine the effectiveness of past and present management strategies directed towards maintaining the historic integrity of these stocks while continuing to provide for maximum diversified recreational fishing opportunities. These data will also be used to evaluate and implement new strategies which may be applied in the future. This investigation is viewed as a first phase effort to acquire needed data relative to the biology of Susitna River drainage wild rainbow trout and the harvest of these stocks. Results of past work are summarized in Bradley (1990, 1991).

The objectives of the research during 1991 were to provide:

1. estimates of age compositions, length distributions, and mean length-at-age of rainbow trout sampled by hook and line in two reaches of Lake Creek;

2. estimates of the age compositions, length distributions, and mean length-at-age of rainbow trout sampled by hook and line in two reaches of the Talachulitna River;

3. estimates of the age compositions, length distributions, and mean length-at-age of rainbow trout sampled by hook and line in two reaches of the Deshka River; and,

4. estimates of the age compositions, length distributions, and mean length-at-age of rainbow trout sampled by hook and line in the North Fork of the Kashwitna River.

METHODS

Study Area

The Susitna River drainage is comprised of hundreds of clear and glacial tributaries originating from two major mountain drainages (Talkeetna and Alaska ranges) generally flowing in a southerly direction and finally emptying into upper Cook Inlet (Figure 3). Select tributaries of this system were sampled during the period of this study: Lake Creek and the Talachulitna, Deshka, and Kashwitna rivers. Three of these study tributaries were further divided into upper and lower study reaches.

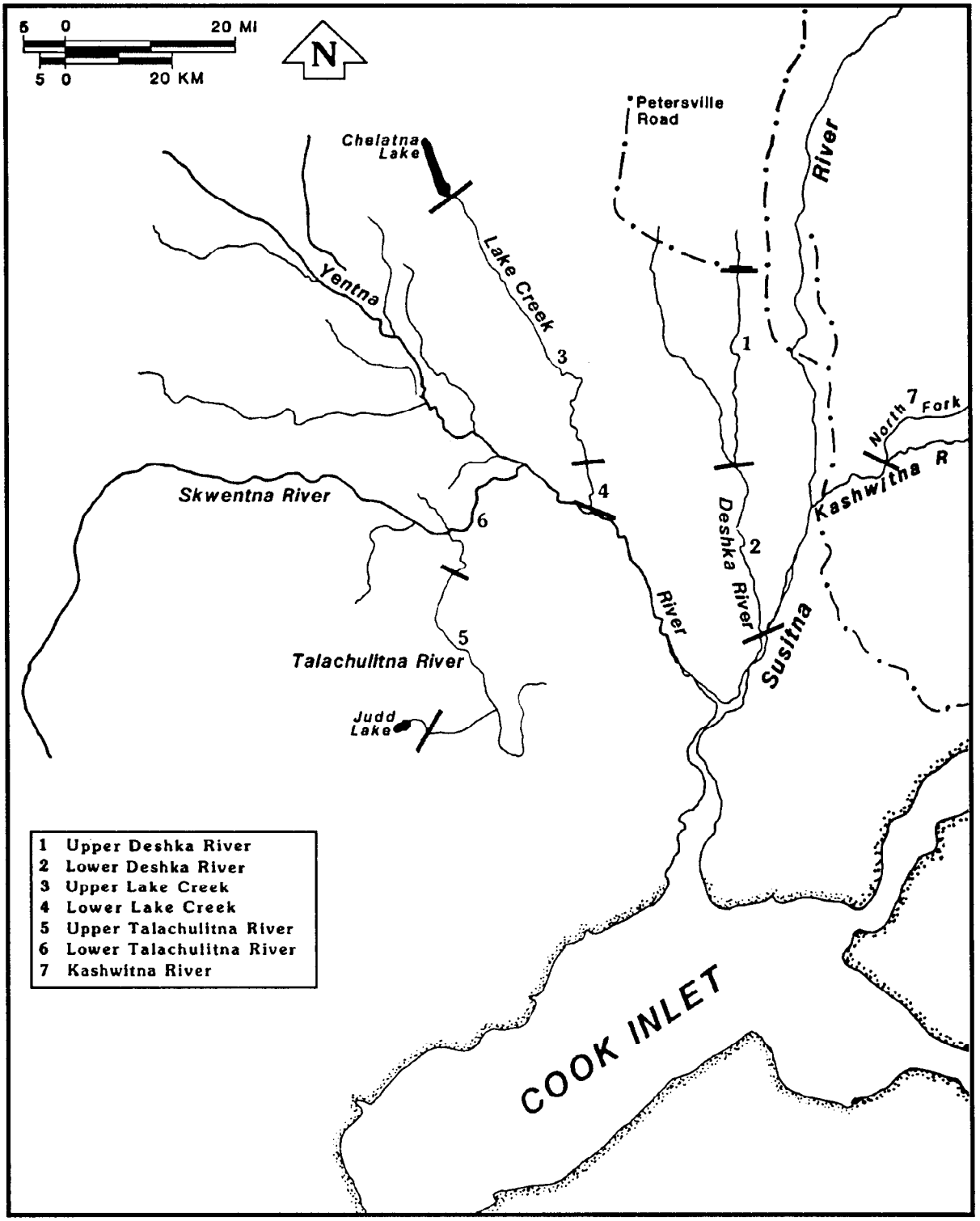

Figure 3. Map of study reaches sampled during 1991.

Lake Creek

Lower Reach: from its confluence with the Yentna River to about 5.6 km upstream.
Upper Reach: from the upstream terminus of the lower reach to the outlet of Chelatna Lake, a distance of 86 km.

Talachulitna River

Lower Reach: from its confluence with the Skwentna River upstream 5.2 km.
Upper Reach: from the outlet of Judd Lake downstream to a point called mid-way (Highline Lake Area), a distance of 58 km.

Deshka River

Lower Reach: from its confluence with the Susitna River upstream to the forks, 42.1 km.
Upper Reach: from the forks upstream to the Petersville road, a distance of 38.8 km.

Kashwitna River

In the North Fork of the Kashwitna River from its confluence with the Kashwitna River upstream approximately 6.4 km.

Sampling reaches on Lake Creek and the Deshka River were subdivided by regulatory management area (catch and release versus allowable harvest areas; lower and upper reaches, respectively) and on the Talachulitna River by reaches differing in angler effort (high versus low angler use; lower and upper reaches, respectively). Sample reaches were identified and numbered on USGS maps (scale 1:250,000) and stream reach identification numbers were entered on all data collection forms.

Data Collection

Rainbow trout were collected from mid-June through mid-October 1991. Past research has shown that age and size compositions of rainbow trout sampled using different gear types differed significantly (Bradley 1991). For this reason, and to allow sampling to be representative of the fish caught in the sport fishery, hook and line gear was used exclusively to sample fish. Hook and line sampling was conducted with both conventional spin and fly casting equipment with terminal gear consisting of artificial lures and/or salmon roe as bait. Salmon roe was employed as a fish attractant on the Deshka River in an attempt to increase catch rates.

Sampling was conducted by two groups. Department personnel were the primary sample collectors and sampled at all locations. Select lodge operations and interested members of local sport fishing associations provided additional age and length information from their catches within the project area. Department personnel worked closely with the volunteers to ensure that sampling techniques mimicked those of the department.

The fork length (FL) of all collected rainbow trout was measured to the nearest 1 mm. At least five scales were collected from all rainbow trout over 175 mm in FL from the left side of each fish about two rows above the lateral line and on a diagonal row downward from the posterior insertion of the dorsal fin (Clutter and Whitesel 1956, Alvord 1954, and Maher and Larkin 1955). Scales were cleaned and placed in coin envelopes that were labeled with appropriate identification. Scales were later transferred to gum cards and thermohydraulically pressed against acetate cards. Resulting impressions were projected on a microfiche reader from which ages were determined. Otoliths and scales were collected from all sampling mortalities. Insufficient numbers of mortalities (four fish), however, prevented conducting any type of comparison between age structures. In addition, all rainbow trout over 175 mm FL sampled by department personnel were tagged with an individually numbered Floy anchor tag and released. The tag numbers of all previously marked rainbow trout were recorded and the fish released.

Data Analysis

The numbers of adult rainbow trout collected were summarized by study reach and sampling period. Mean lengths and length distributions were calculated for each study reach using standard procedures. Length distributions were compared among sampling sites using a Kolmogorov-Smirnov two-sample test (Sokal and Rohlf 1969).

The age compositions of the rainbow trout sampled at each study site were estimated. Letting p_{hi} equal the estimated proportion of age class h in stratum i, the variance of p_{hi} was estimated by (Scheaffer et al. 1979):

$$V(\hat{p}_{hi}) = \hat{p}_{hi}(1-\hat{p}_{hi})/(n_{Ti}-1), \quad (1)$$

where n_{Ti} is the number of legible scales read from samples collected during stratum i. The hypothesis that the age compositions were independent between study reaches (i.e., the same for all study reaches) was tested using chi-square contingency table tests. These chi-square tests were conducted at an alpha level of 0.05 and were performed using the CHISQUARE module of the software package MINITAB (MINITAB 1988).

Mean length-at-age for rainbow trout sampled from each study reach was estimated by:

$$\bar{l}_a = \frac{\sum_{i=1}^{n_a} l_{ai}}{n_a} \quad (2)$$

where:

$\bar{l}_a$ = mean length at age a,

l_{ai} = length of i^{th} fish at age i, and

n_a = number of fish at age a.

The variance of $\bar{l}_a$ was estimated by:

$$\text{Var } \bar{l}_a = 1/n_a \sum_{i=1}^{n_a} (l_{ia} - \bar{l}_a)^2/(n_a - 1). \quad (3)$$

Analysis of variance procedures (ANOVA) were used to test the hypothesis that there were no differences in mean length-at-age between reaches when controlling for age and that there was no interaction between these two factors. The analysis was carried out separately for each age group using the SAS GLM procedure for general linear models (SAS 1988).

RESULTS

Catches

During 1991, 1,104 rainbow trout were collected from the study reaches (Table 1). Of the fish caught, 256 and 252 were caught in the upper and lower reaches of Lake Creek, respectively; 213 and 262 in the upper and lower reaches of the Talachulitna River, respectively; and 89 from the Kashwitna River. The remaining 32 fish were captured at the Deshka River[1]. Sampling success appeared to be positively correlated to spawning concentrations of salmonids.

The majority of rainbow trout sampled in the upper Lake Creek study reach were primarily taken from one of two locations: (1) from the outlet of Chelatna Lake downstream approximately 8 km and (2) from a 3.2 km stretch just upstream of the terminus of the lower Lake Creek study reach. Lower Lake Creek study reach samples were distributed evenly throughout the study reach. The majority of rainbow trout sampled on the upper Talachulitna River study reach were taken from the lower 13 km of Talachulitna Creek and then downstream to its confluence with the Talachulitna River to a location called mid-way (Highline Lake area), a distance of approximately 34 km. Lower Talachulitna River study reach samples were distributed evenly throughout the study reach. All samples from the Kashwitna River were taken from a 5.8 km stretch of the North Fork directly upstream of its confluence. Sampling at the Deshka River was scattered from its confluence with the Susitna River to the Neil Lake area, a distance of approximately 32 km, and a 13 km section of Moose Creek south of the Petersville Road.

Mean Length and Length Distributions

Rainbow trout sampled from all study reaches ranged in fork length from 195 mm to 584 mm and had mean fork lengths ranging from 319 mm to 367 mm (Table 2). Rainbow trout sampled from the upper Lake Creek reach exhibited the lowest mean fork length while rainbow trout sampled from the lower Talachulitna River reach exhibited the largest mean fork length (Figure 4). Also, rainbow trout sampled from the upper reaches of both Lake Creek and the Talachulitna River

[1] A sample size of 32 fish was insufficient for meaningful analysis.

Table 1. Summary of rainbow trout collected by study reach from select Susitna River tributaries, 1991.

Dates	Deshka River		Lake Creek		Talachulitna River		Kashwitna River
	Upper	Lower	Upper	Lower	Upper	Lower	
09/12 - 09/14	22						
09/28 - 10/01		10					
09/21 - 09/30			256				
09/04 - 09/08				252			
07/26 - 08/01					160		
08/19 - 08/26					53		
08/02 - 08/22						262	
07/26 - 08/20							89

Total for all locations = 1,104

Table 2. Mean lengths of rainbow trout sampled using hook and line gear from select Susitna River tributaries during 1991.

Stream/Reach	Number Measured	Mean Length	Standard Error	Minimum Value	Maximum Value
Kashwitna River	89	353	62.6	195	525
Lake Creek					
Upper Reach	256	319	12.3	200	495
Lower Reach	252	353	17.8	204	520
Talachulitna River					
Upper Reach	213	346	23.4	200	515
Lower Reach	262	367	20.2	227	584

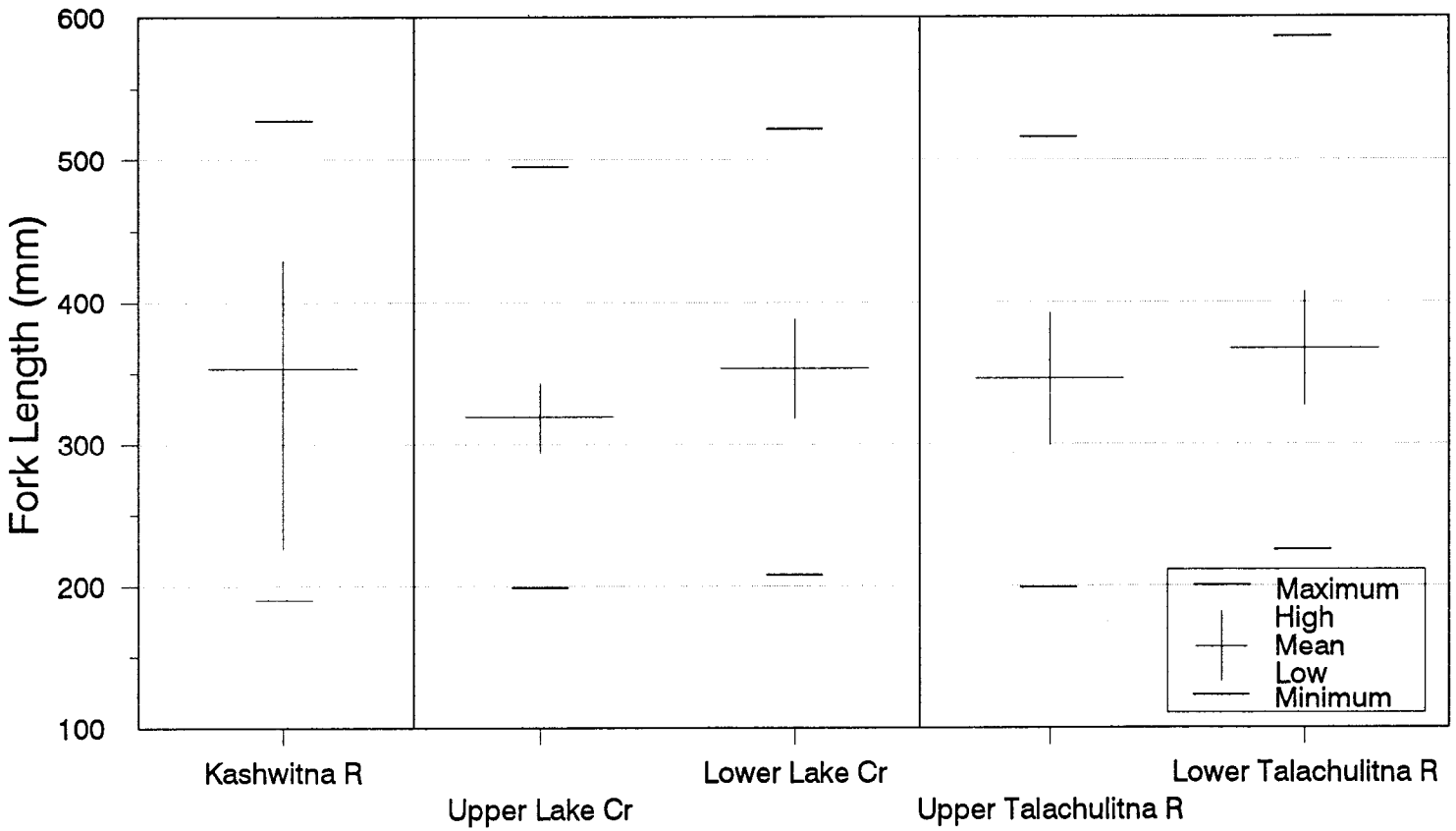

Figure 4. Comparison of mean lengths of rainbow trout sampled between study reaches in the Susitna River drainage using hook and line gear during 1991.

exhibited lower mean lengths than those sampled from the lower reaches in these two streams (Table 2).

The length distributions (Figure 5) of rainbow trout differed significantly ($P < 0.05$) between some of the sampling locations (Table 3). The upper Lake Creek reach was the only one which exhibited a slength distribution significantly different from all the other reaches. The upper Lake Creek reach exhibited a distribution weighted in favor of smaller trout in comparison to the other reaches. The lower Talachulitna River reach exhibited a distribution weighted in favor of larger trout, although not significantly different from the Kashwitna River reach. Interestingly, reaches for which length distributions did not differ significantly were remote from one another (e.g., the lower Lake Creek and the upper Talachulitna River and Kashwitna River distributions and the upper and lower Talachulitna River and Kashwitna River distributions).

Age Composition Statistics

Rainbow trout sampled from all study reaches during 1991 ranged in age from 2 to 7 years (Table 4). Rainbow trout ages 3-6, however, were the most common rainbow trout captured at all study reaches. Age compositions of rainbow trout sampled from the upper and lower study reaches in Lake Creek were not significantly different during 1991 ($\chi^2 = 3.99$, 3 d.f., $P > 0.05$). Thus, these two reaches were combined for further analyses. In contrast, the age compositions of rainbow trout sampled from the upper and lower study reaches in the Talachulitna River differed significantly ($\chi^2 = 14.52$, 3 d.f., $P < 0.05$). The lower study reach in the Talachulitna River contained more age 5 and less age 4 rainbow trout than did the upper study reach (Figure 6). Thus, these two study reaches were not combined for further analyses. Overall, the age compositions of rainbow trout sampled from the upper Talachulitna River, the lower Talachulitna River, Lake Creek, and the Kashwitna River study reaches during 1991 (Figure 6) differed significantly ($\chi^2 = 36.63$, 9 d.f., $P < 0.05$).

Mean Length-at-Age Statistics

As expected, mean length-at-age increased with age for rainbow trout sampled in all study reaches (Table 4). However, significant ($P = 0.003$) differences in mean length-at-age occurred for rainbow trout sampled from each of the study reaches. In general, rainbow trout sampled from the upper Lake Creek and upper Talachulitna River study reaches were larger-at-age than for the other study reaches (Figure 7).

Migration

Unfortunately, insufficient numbers of tag recoveries prohibited making an accurate evaluation concerning migratory patterns of Susitna Basin rainbow trout. The limited tag recoveries from fish sampled at Lake Creek, however, do suggest that there may be some extensive migrational movements occurring between the upper and lower study reaches in this stream. For example, a fish that was tagged at the headwaters of Lake Creek moved downstream a distance of approximately 83 km during a 2-week period, and was recovered at the creek's mouth. Also, trout tagged in the no-kill area of Lake Creek migrated freely in and out of the harvest area, a migration which appeared to be triggered by

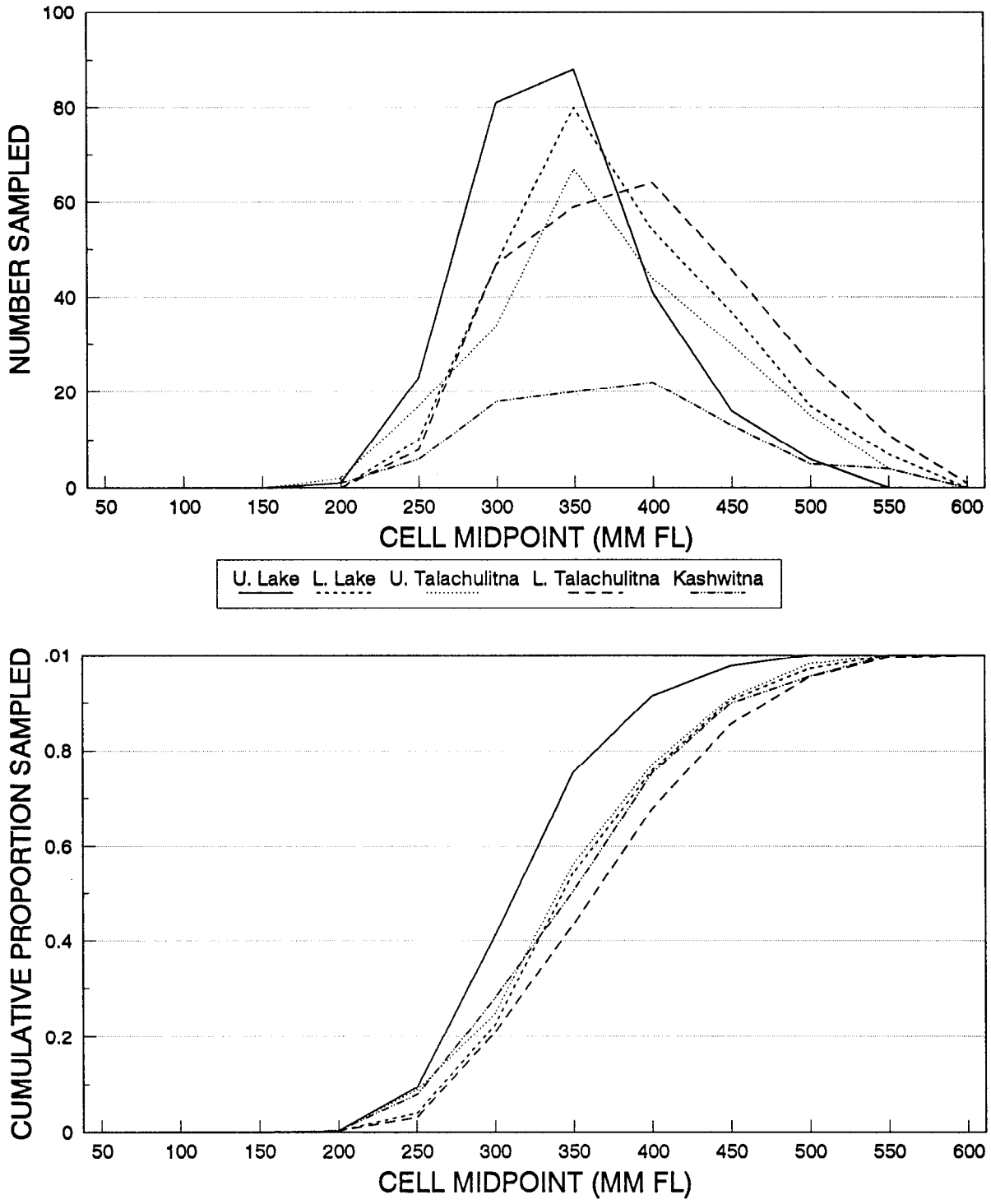

Figure 5. Comparison of length distributions of rainbow trout sampled between study reaches in the Susitna River drainage using hook and line gear during 1991.

Table 3. Comparison of length distributions of rainbow trout sampled using hook and line gear from select Susitna River tributaries during 1991.

Study Reach	Lower Lake Creek	Upper Talachulitna R.	Lower Talachulitna R.	Kashwitna River
Upper Lake Creek	P = 0.0000 D = 0.2255	P = 0.0002 D = 0.1960	P = 0.0000 D = 0.3348	P = 0.0001 D = 0.2678
Lower Lake Creek		P = 0.3591 D = 0.0832	P = 0.0268 D = 0.1268	P = 0.8658 D = 0.0700
Upper Talachulitna River			P = 0.0082 D = 0.1500	P = 0.1911 D = 0.1324
Lower Talachulitna River				P = 0.5364 D = 0.0949

Table 4. Age composition and mean length-at-age statistics of rainbow trout sampled using hook and line gear from select Susitna River tributaries during 1991.

Sample Site	Age Group	Sample Size	Age Composition		Mean Length-at-Age			
			Percent	SE	Mean	SE	L 95% CI	U 95% CI
Kashwitna River								
	2	1	1.8	1.75	225	---	---	---
	3	11	19.3	5.27	260	4.55	251	269
	4	14	24.6	5.75	300	8.79	283	317
	5	21	36.8	6.54	365	6.53	352	378
	6	10	17.5	5.08	430	14.16	402	458
Upper Lake Creek Reach								
	2	1	0.6	0.60	255	---	---	---
	3	25	16.3	2.87	271	5.67	260	282
	4	77	47.6	3.89	305	3.88	279	313
	5	46	28.3	3.51	345	5.82	334	356
	6	10	6.0	1.85	413	8.30	397	429
	7	2	1.2	0.85	468	26.50	416	520
Lower Lake Creek Reach								
	2	0						
	3	23	11.7	2.29	261	3.77	254	268
	4	85	43.1	3.54	317	3.48	310	324
	5	65	33.0	3.36	370	4.77	361	379
	6	21	10.7	2.20	440	9.07	422	458
	7	3	1.5	0.87	489	10.48	468	510
Upper Talachulitna River Reach								
	2	1	0.5	0.47	200	---	---	---
	3	17	10.1	1.86	253	6.79	240	266
	4	72	42.9	3.25	308	3.95	300	316
	5	45	26.8	2.80	360	4.86	350	370
	6	29	17.3	2.36	430	6.59	417	443
	7	4	2.4	0.94	484	14.11	456	512
Lower Talachulitna River Reach								
	2	0						
	3	18	8.5	1.93	278	9.25	260	296
	4	67	31.8	3.21	317	4.82	308	326
	5	96	46.0	3.44	376	5.26	366	386
	6	25	11.8	2.23	437	9.84	418	456
	7	4	1.9	0.94	456	30.23	397	515

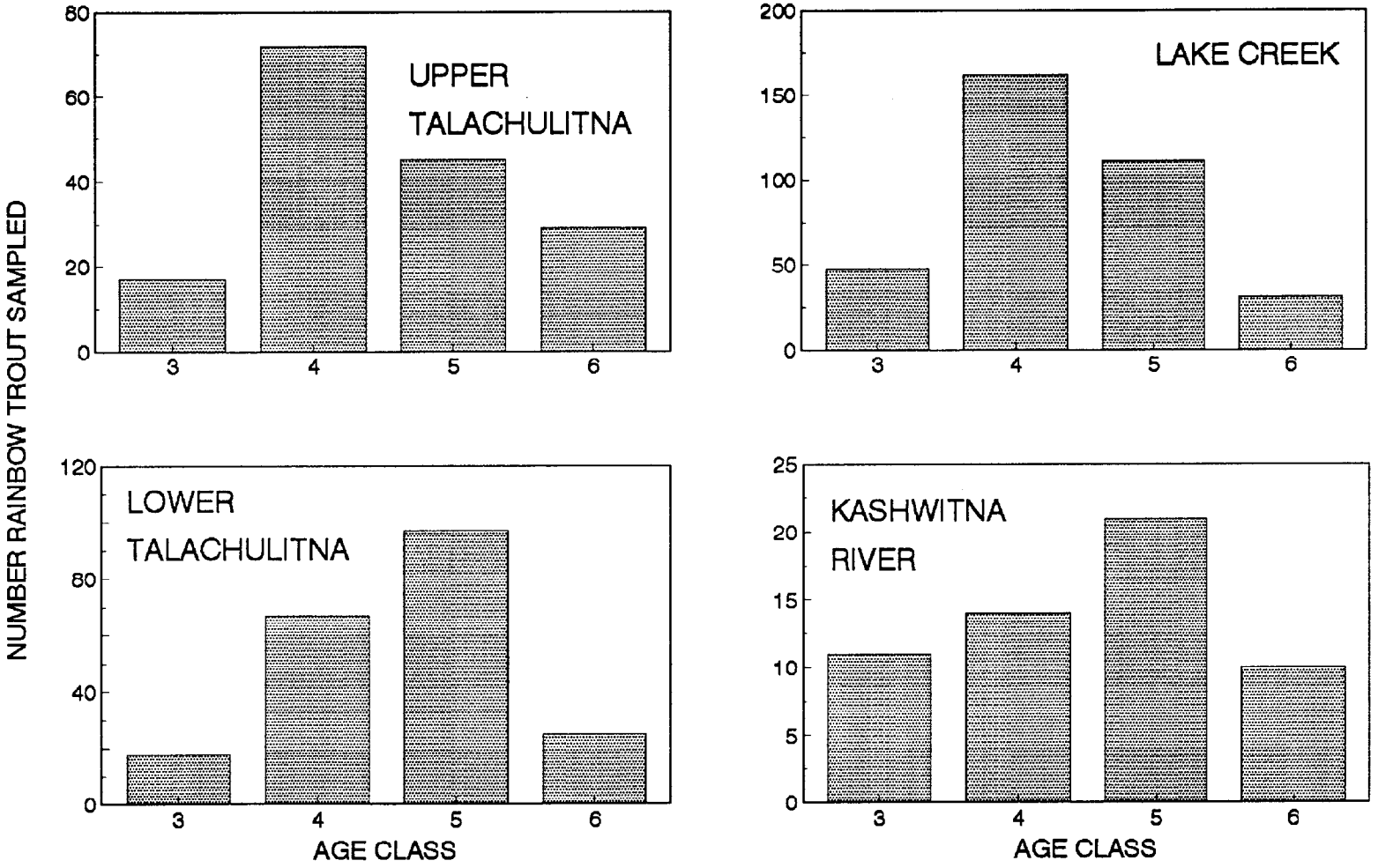

Figure 6. Comparison of age compositions of rainbow trout sampled between study reaches in the Susitna River drainage using hook and line gear during 1991.

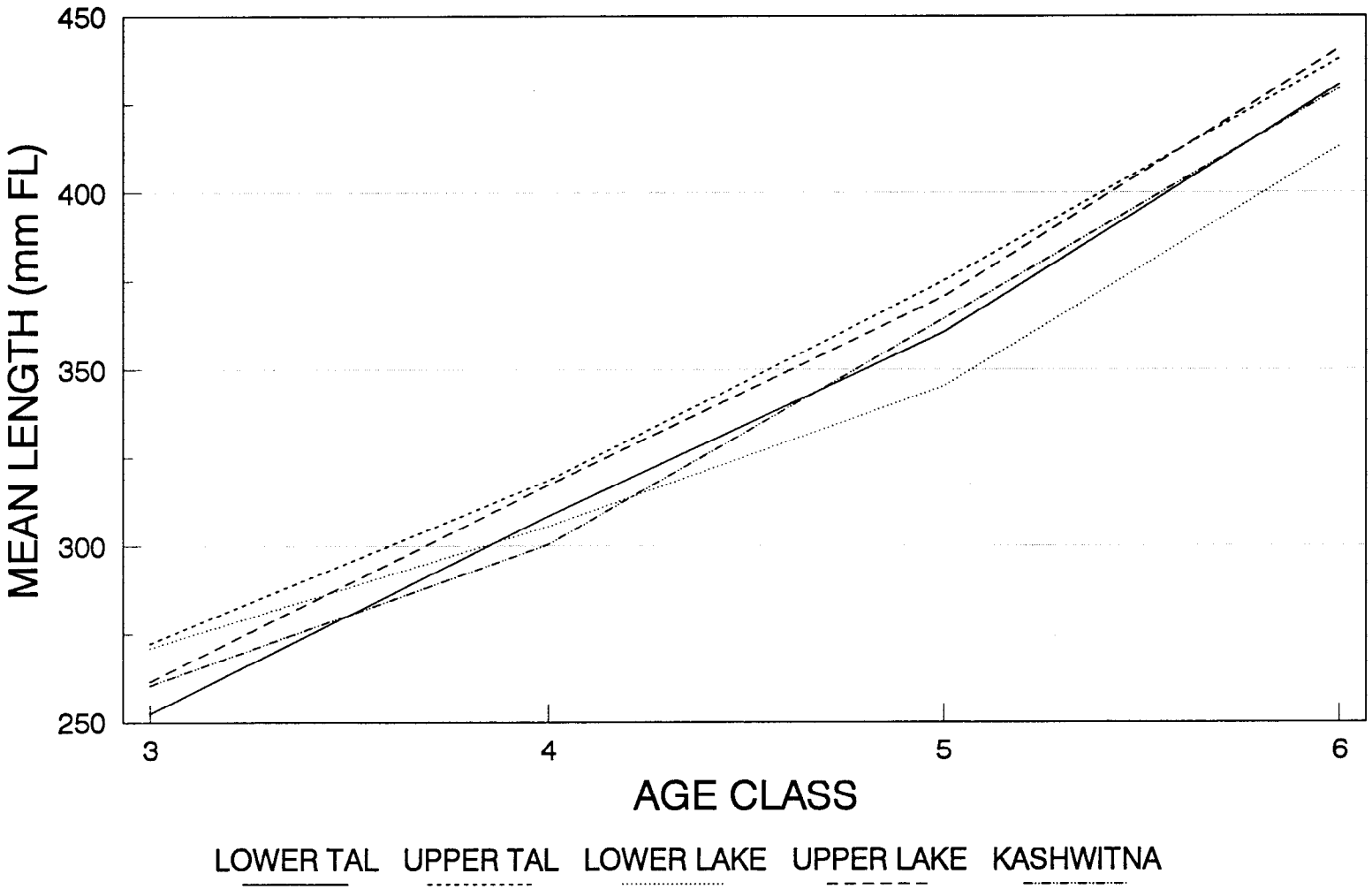

Figure 7. Comparison of mean length-at-age statistics of rainbow trout sampled between study reaches in the Susitna River drainage using hook and line gear during 1991.

the temporal and spatial availability of food items (salmon eggs). Rainbow trout concentrations were only evident where spawning activity of salmonids was evident; once this activity ceased, trout dispersed immediately.

DISCUSSION

Limited recovery of tagged fish in this study suggests that there may be some extensive migrational movements occurring between study reaches, particularly reaches within the same tributary. Such findings are supported by previous research conducted on the Susitna River (Sundet 1986) which has documented extensive migratory movements of up to 92 km. These data suggest that rainbow trout populations within the Susitna River drainage are open in terms of recruitment. These findings question the validity of managing areas under unique regulations, such as catch and release, given that fish protected by a catch and release regulation may be vulnerable to exploitation in a sport fishery operating in another area.

The recovery of tagged fish indicates that the rainbow trout populations of the Susitna River may be relatively open. Although confounded by difference in time of sampling, significant differences occurred in mean lengths, length distributions, age compositions, and mean lengths-at-age of rainbow trout captured between some reaches in study streams and between some study streams. In combination, these size and age data suggest that multiple stocks of rainbow trout inhabit the Susitna River basin. Thus, the question still remains as to whether or not Susitna Basin stream rainbow trout populations are discrete or part of a larger, more open population and, if they are part of an open population, to what extent these populations overlap. These questions need to be addressed before any quantifiable work related to stock abundance can be initiated.

Previous (Bradley 1990, 1991) and current attempts to collect adequate numbers of rainbow trout on the Deshka River have failed using conventional hook and line methods (Bradley 1990). During both 1990 and 1991, chumming with salmon roe was attempted to concentrate rainbow trout for capture. This strategy was not successful and sampling goals were not attained using this approach. Though low catch rates on this system may have been, in part, due to unseasonably high waters, it appears more likely that fish in this system are more widely dispersed. If desired sampling goals are to be attained for this system in the future, alternate means of capture gear (e.g., electrofishing gear) will need to be evaluated. Also, sampling success during this study appeared to be positively correlated to spawning concentrations of salmonids. For this reason, it is recommended that future sampling using hook and line gear be conducted during periods of peak availability of spawning salmonids to increase catch rates with this gear type.

Some comparisons can be made between results from 1991 and previous years' data from 1989 and 1990. All studies showed that rainbow trout sampled from the lower study reaches in Lake Creek and the Talachulitna River using hook and line gear ranged in age from 2 to 7 years and that trout ages 3-6 were the most common captured at both streams (Figure 8). Results also suggest that rainbow trout captured during all years exhibited similar trends in mean length-at-age (Figure 8). However, significant differences ($P < 0.05$) in age compositions occurred for both streams between all years (Table 5). Also, the

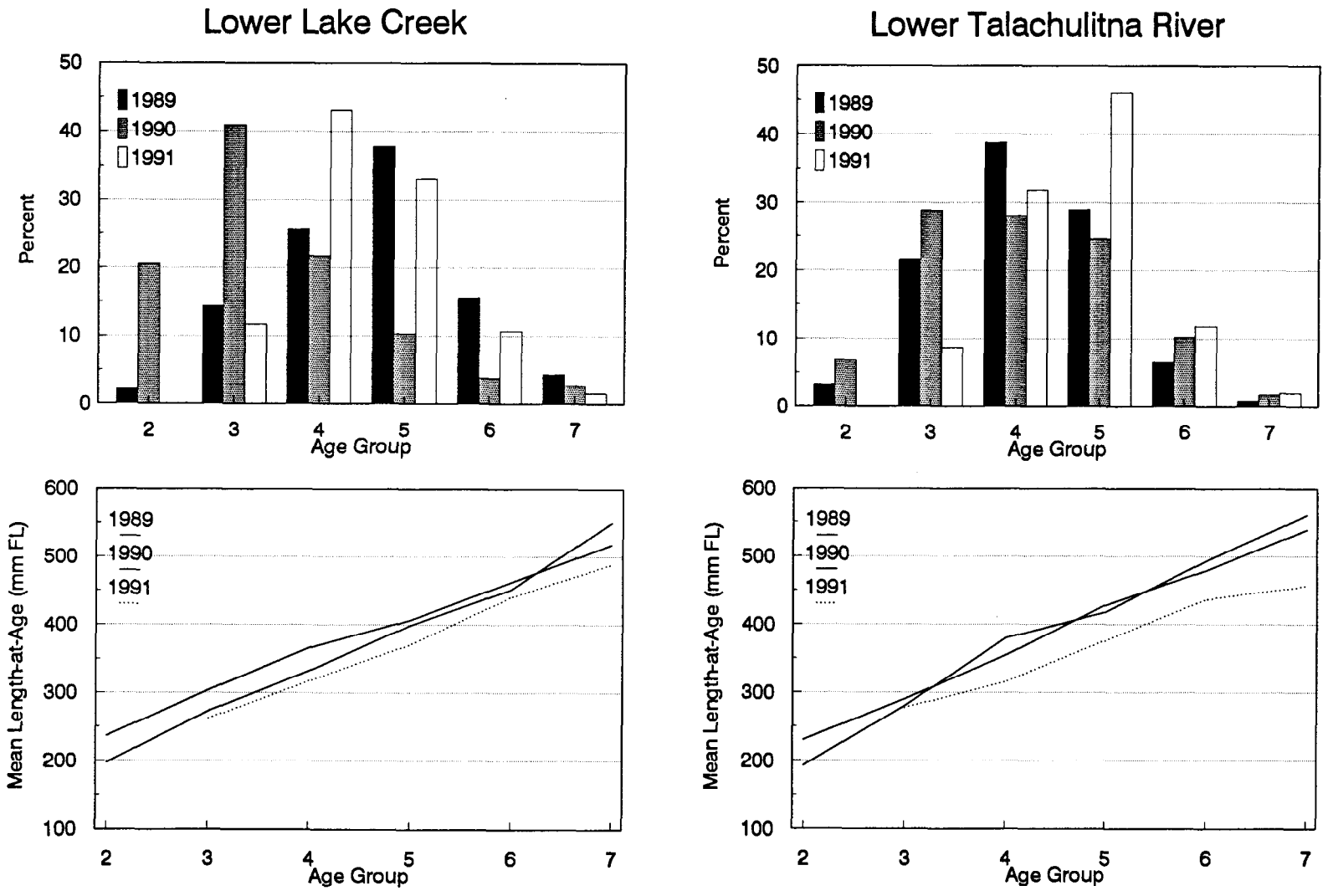

Figure 8. Comparison of age composition and mean length-at-age statistics of rainbow trout sampled using hook and line gear from the lower study reaches in Lake Creek and the Talachulitna River during 1990 and 1991.

Table 5. Comparison of age composition and mean length-at-age statistics for rainbow trout sampled using hook and line gear from the lower study reaches in Lake Creek and the Talachulitna River during 1989, 1990, and 1991.

Age Group	1989 Data[a]			1990 Data[b]			1991 Data		
	n	Percent	Length	n	Percent	Length	n	Percent	Length
Lower Lake Creek									
2	2	2.2	237	16	20.5	198			
3	13	14.4	304	32	41.0	273	23	11.7	262
4	23	25.6	366	17	21.8	332	85	43.1	317
5	34	37.8	407	8	10.3	399	65	33.0	371
6	14	15.6	463	3	3.8	452	21	10.7	441
7	4	4.4	518	2	2.6	550	3	1.5	489
All	90	100.0	401	78	100.0	311	197	100.0	353
Lower Talachulitna River									
2	4	3.3	193	8	6.7	230			
3	26	21.5	280	34	28.8	290	18	8.5	278
4	47	38.8	380	33	28.0	355	67	31.8	316
5	35	28.9	418	29	24.6	428	97	46.0	376
6	8	6.6	493	12	10.2	479	25	11.8	437
7	1	0.9	560	2	1.7	539	4	1.9	456
All	121	100.0	392	118	100.0	388	211	100.0	367

[a] Data from Bradley (1990).

[b] Data from Bradley (1991).

overall mean lengths of rainbow trout sampled during each year varied considerably (Table 5). In combination, these data suggest that age and size compositions in these streams vary annually. This finding suggests that establishment of a baseline database of age and length composition statistics for Susitna River wild rainbow trout stocks will take more than a single year to compile. Such findings also show the difficulty in managing Susitna River basin rainbow trout stocks for historic size and age compositions.

Interestingly, there appeared to be a relative lack of age 2 and 3 trout from the lower reach samples from Lake Creek and Talachulitna River. In both cases, it appeared that the age compositions had shifted one year. These data suggest that both systems may have suffered from a failure of young trout recruiting into the populations during 1991. The impact that this possible recruitment failure may have on each population must be monitored in the future to assure for the continued health of these stocks.

Rainbow trout over 510 mm FL (20 in) have been defined as trophy class trout in the CIRTMP. Based on the data collected during this study, the 1990 study (Bradley 1991), and a study conducted by Sundet (1986) in the Susitna River drainage above Talkeetna, the Susitna River appears to contain few trout over 510 mm in length (Figure 9). Also, it appears that Susitna Basin rainbow trout are generally shorter lived and experience slower growth rates than those found in other Alaskan systems known to contain trophy class trout (Figure 9). The slow growth rates and short longevity of Susitna River basin rainbow trout are likely correlated to a lack of large lake basins coupled with less productive waters in terms of water temperature and numbers of adult spawning salmon that these systems support. Whatever the reason, these data suggest that Susitna River rainbow trout stocks are not viable candidates for management as trophy fisheries under the CIRTMP.

RECOMMENDATIONS

Given the observed variability in age and size compositions of rainbow trout sampled annually between systems, it is recommended that sampling for age and size composition, based on hook and line surveys, be continued on Lake Creek and the Talachulitna and Kashwitna rivers for at least one more year. Three consecutive years of data per study site should provide the department with a useful foundation of stock age and size parameters to make purposeful management recommendations to the Alaska Board of Fisheries in regards to managing these stocks for historic size and age structure as recommended by the CIRTMP. These data will also prove useful in monitoring possible failures in recruitment to the lower Lake Creek and Talachulitna River stocks suggested by the 1991 data.

It is also recommended to expand the study to include Peters Creek, a tributary of the Yentna River. A major trout fishery is beginning to occur on this stock and little historic data exist to evaluate the effects of the developing fishery on this trout stock.

Lastly, it is recommended that a large-scale tagging study using electrofishing and hook and line gear be initiated on the Susitna River for obtaining needed information on rainbow trout stock structure and migration. This information is needed before quantifiable assessments of stock density

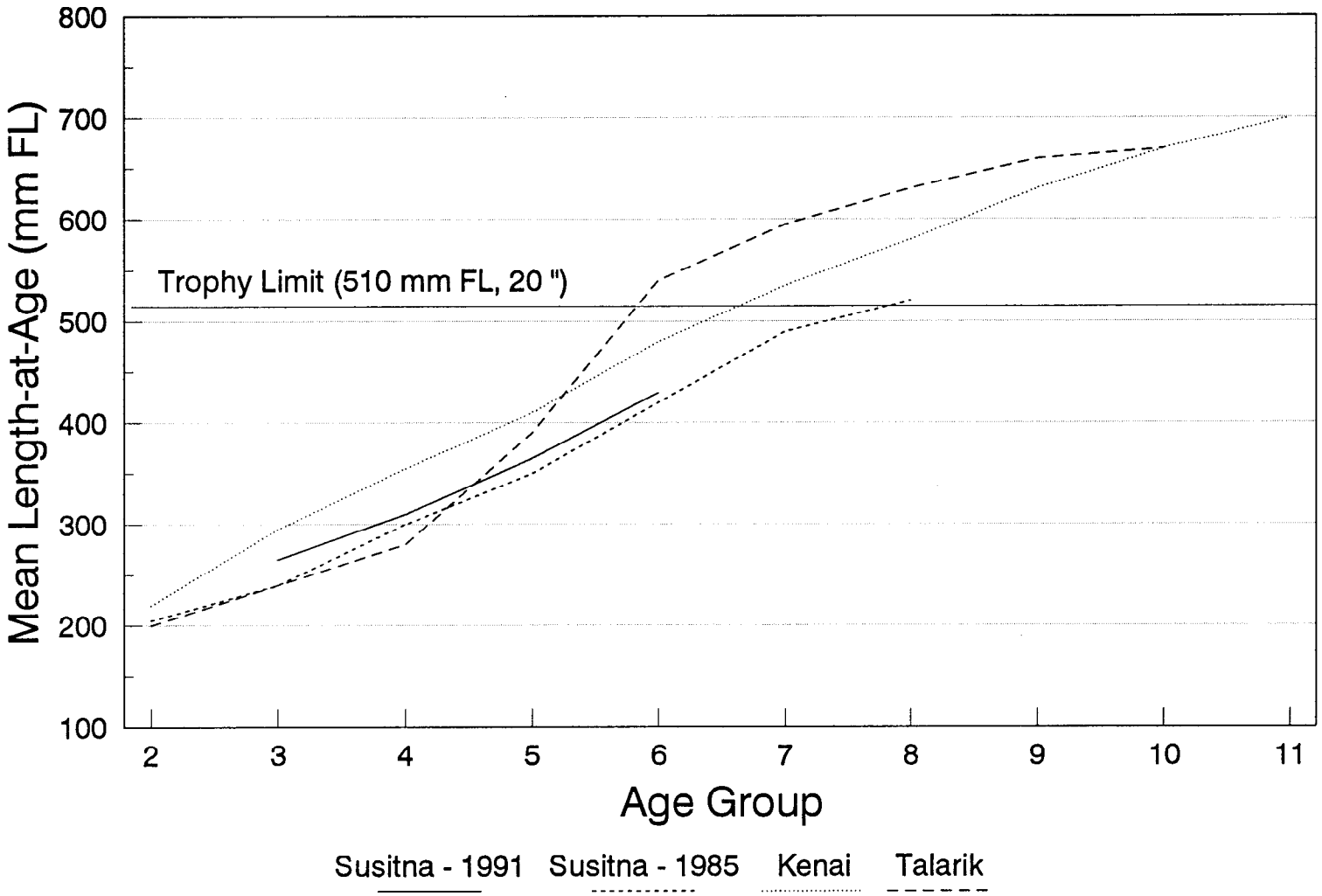

Figure 9. Comparison of mean length-at-age statistics for rainbow trout sampled from several Alaskan river systems.

can be initiated. These types of data are required to effectively evaluate and implement existing or new management strategies for Susitna Basin streams. Before electrofishing studies can be initiated on a large-scale, however, it is recommended that further testing be conducted of straight DC current as a means to reduce injury (Holmes et al. 1990). The lower 5 km of Lake Creek or a 30 km portion of the Deshka River are the recommended areas for this evaluation.

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